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PROWATER

European Regional Development Fund



Developing rewarding schemes for Nature-based Solutions,
specifically targeted at (but not limited to) increased
infiltration and retention of rainwater

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CONTENT

SUMMARY	4
INTRODUCTION.....	5
DEVELOPPING REWARDING SCHEMES for EbA	8
1. IDENTIFY SERVICE.....	9
1.1 landscape-based vs. one-fits-all approaches : knowing where, why & how to act	9
Reflections on landscape-based vs. one-fits-all approaches	10
1.2 Identify potential buyers, sellers & brokers.....	11
Reflections on the role of private sector companies and organisations	12
Reflections on the role of the public sector & Policy recommendations	13
Reflections on the role of the non-profit sector sector/trusts	18
Reflections on the role of the private insurance & banking sector	18
2. ESTABLISH PAYMENT SCHEME.....	19
2.1 Setting boundaries to rewarding schemes for EbA	19
Reflections on the scale of action	19
2.2 Effort vs. (modelled) result-based payment schemes	19
Reflections on the effort-based and (modelled) result-based approaches	19
3. NEGOTIATE AND IMPLEMENT.....	22
3.1 Negotiate agreements: price setting	22
Reflections on the different approaches to price-setting	22
Reflections on risk of non-delivery of targeted ecosystem services	23
Reflections on the durability of payment schemes and ES provisioning	24
Reflections on the concept of price setting	24
3.2 Minimise friction/lower transaction costs	24
4. MONITOR, REPORT & VERIFY.....	27
5. CONSIDER OPPORTUNITIES FOR PAYMENT OF MULTIPLE ES.....	28
Reflections on opportunities for Integrated catchments-based approaches.	28
Reflections on bundled rewarding schemes with a single buyer	28
Reflections on stacked/layered rewarding schemes with multiple buyers	29
CONCLUSION.....	30
REFERENCES.....	31

SUMMARY

Climate change is increasing the frequency and extremity of weather events, resulting in droughts and floods that have an unacceptable impact on society and environment. There are Ecosystem-based Adaptation (EbA) measures, a Nature-based approach to climate adaptation, that can increase downstream water availability during droughts and buffer water upstream during flooding, increasing the landscapes resilience to climate change. These measures need to be taken on both public and private land to reach climate adaptation objectives at the European level. However, most land-owners and managers will not implement them without (financial) incentives.

Success factors and pitfalls have not been clearly identified for private and public payment schemes for EbA targeted specifically at increased water infiltration and retention. From 2019 to 2021, a high-level PROWATER seminar, panel discussion and several (expert) workshops were organized on 'How to incentivise Nature-based Solutions' within the 2 Seas area, including regions in the United Kingdom, the Netherlands, France and Flanders. We welcomed international experts through keynote talks and workshops to reflect on practice & policy recommendations for the design and implementation of payment schemes for EbA targeted at increased water infiltration and retention capacity of our landscapes.

This report summarises these PROWATER events into practice recommendations when developing a payment scheme for EbA, specifically targeted at (but not limited to) increased water infiltration and retention. Many of the practice recommendations are relevant to local initiatives that wish to set-up a smaller scale payment schemes for EbA. Special attention is also given to policy recommendations that can facilitate the development and implementation of payment schemes for EbA in practice, on smaller and larger scales.

INTRODUCTION

Many landscapes in Western Europe have been altered for agricultural intensification and urban development. Groundwater recharge and water retention has decreased due to increased soil sealing, soil compaction, drainage of upland wetlands and intensified land-use in general. These changes have reduced the resilience of hydrological systems, making river flows less buffered and more responsive to anomalies in precipitation (floods and low-flow episodes). Moreover, climate change is increasing the frequency and extremity of weather events, resulting in droughts and floods that have an unacceptable impact on society and environment.

At the European level it is of strategic importance to counter the impact of droughts and excessive rain by increasing the resilience of our landscapes to such stressors (i.e. climate adaptation). To reach climate adaptation targets at the regional, national and European level it is essential to increase the investment of private and public funding as well as dedicate areas of land to Nature-based Solutions for climate adaptation. This is embedded into several EU Directives and Policies:

- Climate Adaptation Strategy (EU)
- Water Framework Directive (EU)
- The Drinking Water Directive (EU)
- Blueprint Water (EU)
- Green Deal (EU)
- EIB Climate Adaptation Plan (EU)
- Biodiversity strategy 2030 (EU)

Increasing or restoring the landscape's natural water retention capacity through Nature-based Solutions is key to improve deep infiltration and can reduce our vulnerability to droughts during dry spells, as well as floods during extreme rainfall events. This is known as Ecosystem-based Adaptation (EbA), a Nature-based approach to climate adaptation (Vignola et al. 2015; Scarano 2015). EbA harnesses ecosystem services (ES) to increase resilience and reduce the vulnerability of human communities and natural systems to the effects of climate change. These measures can be integrated into adapted agriculture, forestry and environmental management. Examples include the restoration of healthy soil (structure), temporal and permanent wetlands, infiltration zones (through forest conversion to low interception vegetation and broadleaf forest types), and meandering river and brook valleys.

A pro-active drought and flood strategy implements EbA measures for increased retention and infiltration of rainwater at strategic locations within the catchment (Karrasch et al. 2017; Holden et al. 2022). Storage and slow release of water can then take place across the entire landscape, restoring the sponge effect of our landscapes. Increasing the upstream storage capacity of water in our landscapes, lowers peak surface water discharges downstream after extreme rainfall events. The slow release of stored water in our landscapes, helps overcome periods with precipitation deficits. By implementing Ecosystem-based Adaptation, we will not only achieve climate change adaptation, but also improve the quality of the environment and the wider benefits it provides to society.

Large-scale implementation of EbA targeted at increased retention and infiltration of rainwater is unlikely to happen without both financial and policy interventions (Collentine and Futter 2018, Ward 2023, van de Sand 2012, Wertz-Kanounnikoff et al. 2011). These measures need to be taken on both public and private land to reach European objectives for climate adaptation, especially including agricultural and (degraded) natural landscapes. Investment in EbA implies a loss of land surface for (industrial/intensive) agriculture, forestry as well as urban and industrial development, implicating a

loss of other (e.g. production-based) subsidies. It may also involve labour costs and a different mode of operation for (agricultural) land management (e.g. implementing bunds and terracing hillslopes). Moreover, the immediate direct benefits for landowners can be limited, especially upstream. The water retention upstream primarily benefits the recharge of aquifers and increased base flow to downstream rivers. Water is then not retained for private uses such as irrigation. Their implementation also has a significant administrative and practical burden (i.e. transaction costs). Moreover, landowner's decision not to invest in EbA measures may be driven by long-term contracts (e.g. bank loans for expensive machinery or technology requiring intensification) and pressures for upscaling and intensification (e.g. production-based subsidies in the Common Agricultural Policy - CAP).

Rewarding schemes can help overcome those barriers to implement EbA measures voluntarily, on top of what is requested through policy and regulation. The basic idea behind rewarding or payment schemes for EbA is that investments made by 'buyers' in EbA measures result in the targeted provision of ecosystem services (ES) by the 'sellers' that implement those EbA measures. This is also the basic principle of what is known as 'Payment for Ecosystem Services' or PES (Tacconi 2012). There are prime examples where private companies are paying landowners, including farmers, to implement measures that improve water resources. Payment schemes can unlock new or alternative funding opportunities for land-managers (Waylen and Martin-Ortega 2018).

Due to a lack of robust-but-low-cost form of Monitoring, Reporting & Verification (MRV) for the delivery of water **quantity** related services (e.g. infiltration and retention of rainwater), water resource payment schemes are mostly limited to water **quality** related services. Water quantity related services are non the less crucial in the context of climate adaptation. This report highlights how expertise developed within PROWATER can facilitate the development of payment schemes targeting water quantity related services, including increased infiltration and retention of rainwater in our landscapes.

For an introduction on payment schemes for Nature-based Solutions targeted at increased infiltration and retention of rainwater in our landscapes, please view the PROWATER online seminar on "How to incentivise Nature-based Solutions" by Dr. Laurence Couldrick (16 September 2021): <https://www.youtube.com/watch?v=HwsRAWPMEm5>

EbA measures targeted at infiltration and retention of rainwater, also result in co-benefits (i.e. ecosystem services additional to the targeted ecosystem services, such as increased biodiversity, water quality, recreational value, etc.). As such, payment schemes for EbA are often a more cost-effective approach to contribute to wider environmental and societal objectives, as compared to technical solutions to climate adaptation (Smith et al. 2013; Seddon et al. 2020). These co-benefits inherent to EbA measures can bring previously conflicting actors together, such as the water abstraction and biodiversity conservation sectors, to go from opposing each other to collaborating (Waylen and Martin-Ortega 2018). Through a participatory development of smaller payment schemes for EbA, e.g. involving farming communities in the scheme design, connectivity across sectors and organisations can improve to the benefit of local climate change adaptation.

Payment schemes for EbA are an additional instrument to reach environmental and societal objectives. They do not replace existing regulatory principles that should still set adequate baselines for minimal ecosystem service provisioning by land managers and implement 'the polluter pays' principles for water quality, as well as water resources (Waylen and Martin-Ortega 2018).

Success factors and pitfalls have not been clearly identified for private and public payment schemes for EbA targeted specifically at increased water infiltration and retention. From 2019 to 2021, a high-level PROWATER seminar, panel discussion and several (expert) workshops were organized on “How to incentivise Nature-based Solutions” within the 2 Seas area, including regions in the United Kingdom, the Netherlands, France and Flanders. We welcomed international experts through keynote talks and workshops to reflect on (policy) recommendations for the design and implementation of payment schemes for EbA targeted at increased water infiltration and retention capacity of our landscapes.

To view the panel discussion on “How to incentivise Nature-based Solutions” and rewarding schemes for Nature-based Solutions targeted at increased water infiltration and retention capacity of our landscapes, please visit: <https://www.youtube.com/watch?v=YbawysuIGVw&t=1s>

Members of the panel included:

- *Dr. Jan Staes as panel moderator - doctoral researcher, ECOSPHERE research group, University of Antwerp*
- *Prof. Trevor Bishop - Organisational Development Director, Water Resources South East*
- *Kees Boks - Policy officer & Project manager, commune Midden-Delfland*
- *Dr. Laurence Couldrick - Director, Westcountry Rivers Trust*
- *Prof. Steven Van Passel - Professor, University of Antwerp*
- *Merel Hendriks - Nederlandse Waterschapsbank (NWB Bank)*

This report reduces the information from PROWATER events to concrete practice recommendations when developing a payment scheme for EbA, specifically targeted at (but not limited to) increased water infiltration and retention.

Special attention is also given to policy recommendations that can facilitate the development and implementation of payment schemes for EbA in practice.

DEVELOPPING REWARDING SCHEMES for EbA

To summarize our collective learning on the Payment for EbA process through the PROWATER project we will follow the stages set out in the DEFRA (Department for Environment, Food & Rural Affairs) Payment for Ecosystem Services (PES) flowchart (Smith et al. 2013¹):

1. IDENTIFY SERVICE: identify a saleable ecosystem service, prospective buyers and sellers
2. ESTABLISH PAYMENT SCHEME: establish payment scheme principles & resolve issues
3. NEGOTIATE & IMPLEMENT: negotiate & implement agreements
4. MONITOR & EVALUATE: monitor, evaluate & review implementation
5. CONSIDER OPPORTUNITIES FOR MULTI-PES

These steps outline the stages in the development of a Payment scheme for Ecosystem-based Adaptation (EbA) measures and resulting Ecosystem Services (ES). The process of going through these steps is relevant to Payment schemes for EbA measures as well as other Nature-based Solutions. It is important to note that although the steps are numbered, in reality it is a circular process (i.e. regular evaluation and feedback to earlier steps is recommended to improve the payment scheme over time) with many stages happening concurrently.

Each step in this report will include practice recommendations (included as *reflections*) when developing and implementing a payment scheme. These are based on PROWATER events from 2019 to 2021, including a high-level seminar, panel discussion and several (expert) workshops on “How to incentivise Nature-based Solutions” within the 2 Seas area. We welcomed international experts through keynote talks and workshops to reflect on (policy) recommendations for the design and implementation of payment schemes for EbA targeted at increased water infiltration and retention capacity of our landscapes.

Where applicable, recommendations are tailored specifically to increased infiltration and retention of rainwater, i.e. the targeted Ecosystem Services within the project PROWATER. Special attention is also given to policy recommendations that can facilitate the development and implementation of payment schemes for EbA in practice.

¹ Find the DEFRA flowchart here: <https://www.gov.uk/government/publications/payments-for-ecosystem-services-pes-best-practice-guide>

1. IDENTIFY SERVICE

This step explores the potential for a payment schemes for EbA in the first instance by identifying:

- potentially saleable ES, i.e. a potentially deliverable ES of value to at least one buyer
- the range of possible buyers and sellers of those ES
- the prospects for trade between buyers and sellers (establish a scale of benefit)

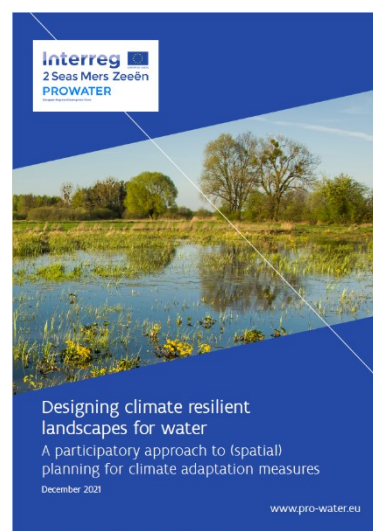
A participatory approach to (spatial) planning for EbA measures is described in [PROWATER Output 1, a report on 'Designing climate resilient landscapes'](#). By following the steps described in this report, the above mentioned sub-objectives can be solved, to help identify the service(s).

For more information on our recommended participatory approach to (spatial) planning for EbA, please read [PROWATER Output 1 'Designing climate resilient landscapes'](#).

The steps to go through include:

- understanding the catchment
- identifying water resource risks & challenges
- identifying & engaging stakeholders
- targeting Ecosystem-based Adaptation within the catchment
- quantifying the targeted Ecosystem Services
- monitoring & adjusting where needed

[DOWNLOAD PROWATER OUTPUT 1 HERE²](#)



1.1 landscape-based vs. one-fits-all approaches : knowing where, why & how to act

In the context of EbA specifically targeting infiltration and retention of rainwater, **identifying potentially deliverable ES** begins with understanding where, why and how measures can be designed to deliver the targeted ES.

In most cases, **simple one-fits-all** payment schemes for EbA are applied: large perimeters without taking into account the suitability of specific locations in the landscape for specific measures, where sellers can easily step in to and request payment for measures considered eligible.

However, some parts of the landscape are better suited to provide the targeted ES. Especially for regulating services such as water retention, carbon sequestration or water purification, geophysical criteria influence the potential of a location for ES provisioning.

In **spatially targeted** payment schemes for EbA, specific zones in the landscape/catchment can be given a suitability score for specific EbA measures, based on geophysical criteria and/or on environmental degradation status. This is known as a **landscape-based approach** to payment schemes for EbA (Wallbott, Siciliano and Lederer 2019; von Thaden et al 2021; Lu et al. 2020; Ghazoul, Garcia and Kushalappa 2009). Only measures that are considered suitable in the zones are then eligible for payment.

² PROWATER report 'Designing water resilient landscapes': <https://www.pro-water.eu/designing-climate-resilient-landscapes-for-water>

To learn more about what EbA measures to (spatially) plan for depending on the locations in the catchment, you can consult the [water system map for Europe](#).

The [water system map](#) is a tool that enables spatial planning for EbA measures at the catchment-level and across borders for catchments in the United Kingdom, the Netherlands, Flanders and France.

The [manual](#)³ helps readers interpret the hydro-zones highlighted by the water system map and select what EbA measures to consider in those locations, to improve infiltration and retention capacity of the landscape. Choices are influenced by the catchment type (runoff dominated vs. groundwater dominated).

[CONSULT THE WATER SYSTEM MAP HERE](#)⁴



Reflections on landscape-based vs. one-fits-all approaches

- It is important to have payment schemes for EbA at different levels of complexity and different scales of action.
- Simple (one-fits-all) and easily accessible payment schemes for EbA can generate broad shifts in land management for generalised problems that can be solved through a uniform approach to implementation of measure and/or management on a larger scale.
- It is important to reorient farmers away from conventional subsidy schemes leading to intensification of production (i.e. production-based payments). Easily accessible payment schemes for EbA can (partially) replace those production-based payments (subsidies) and become a part of the income relied upon.
- Spatially targeted (more complex) payment schemes (i.e. landscape-based approach) can maximize environmental effectiveness and economic efficiency of measures by increasing the chances of actually delivering the targeted ecosystem services paid for, in the most vulnerable, degraded or suitable areas. This leads to specific shifts in land management, tailored to the (sub-)catchment's geophysical and environmental characteristics.
- In spatially targeted (more complex) payment schemes, ES can be provided at a relatively lower cost by implementing measures in areas where the modelled impact of a specific measure is highest (Uthes et al., 2010).
- In smaller scale, spatially targeted payment schemes for EbA, sellers can be invited to propose actions that contribute to specified targeted ES. Modelling can assess whether proposed actions are eligible for payment. This leads to an immediate inspiration of the creative agency of sellers. Examples include landowner-identified valued activities (e.g. via reverse auctions, see chapter 3) and participatory program design. Simple one-fits-all approaches to payment schemes for EbA incur the risk that potential buyers are put off due to conflicts with their own values or restrictions on their creativity and wisdom as stewards of the land (Chan et al. 2017).

³ Manual for the PROWATER water system map:

https://www.pro-water.eu/sites/default/files/2023-03/O3.1_The%20Water%20System%20Map%20for%20Europe%20-%20A%20spatial%20prioritisation%20tool%20for%20climate%20change%20adaptation_Upd1.pdf

⁴ PROWATER water system map: <https://www.pro-water.eu/the-water-system-map-for-europe>

- In spatially targeted payment schemes, not all willing sellers can step into the payment scheme. This can lead to ethical discussions.

1.2 Identify potential buyers, sellers & brokers

Stakeholders can be segmented into functions of prospective Payment schemes for EbA:

- **Buyers:** who will benefit from the ES resulting from EbA measures? Who wants to fund EbA measures? What are shared interests between buyers, or elements of competition?
- **Sellers:** who owns or manages the land where the EbA measures could be implemented to deliver targeted ES? Who is capable to deliver EbA measures to deliver targeted ES?
- **Brokers/Advisors:** who holds the knowledge to inform processes involved in designing and implementing payment schemes for EbA (including the negotiation of agreements and facilitating relationships between buying and selling parties)? Who has the potential to reach many buyers and sellers?

Actors to involve in prospective payment schemes for EbA can include the private (first sector), public sector (second sector) and the non-profit sector/trusts (third sector).

Good communication between strategic partners can provide leverage to the implementation of measures. Strategic partners include stakeholders involved in water policy & management (flood risk management, water quality, water resources), groundwater policy & management (the monitoring of groundwater and permitting of groundwater abstractions), forest policy & management (for biodiversity, game and timber), water sanitation and sewage infrastructure, agricultural policy & rural development. There are important win-win's that need to be explored. At the same time, we need to identify potential conflicts and explore solutions.

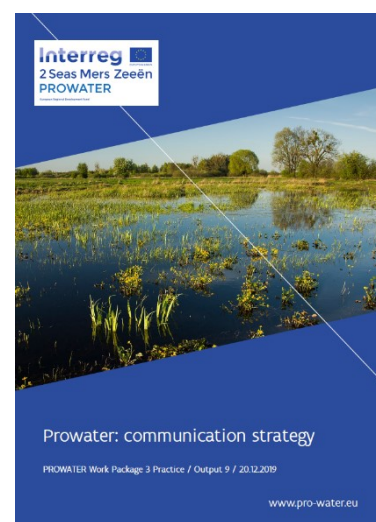
The afore mentioned [PROWATER Output 1, a report on 'Designing climate resilient landscapes'](#) contains guidance for identifying stakeholders in a potential payment schemes for EbA and the context in which they may already be operating.

For more detailed information on how to identify stakeholders as potential buyers, sellers, brokers and tailor information exchanges (by matching audience-message-channel), you can read [PROWATER Output 9 'Communication Strategy'](#).

This comprehensive Communication Strategy developed by PROWATER will:

- 1) guide and support readers as they seek to build a participatory long term vision for EbA measures in their regions
- 2) allow the readers to monitor and evaluate the participatory processes being undertaken and deduce the lessons-learnt

[DOWNLOAD PROWATER OUTPUT 9 HERE⁵](#)



⁵ PROWATER Communication Strategy:

<https://www.pro-water.eu/prowater-communication-strategy>

Reflections on the role of private sector companies and organisations

Private buyers:

- In the private sector, there is a growing recognition of the need to account for externalities, reduce them and where possible offset the remaining negative impacts of externalities. The realisation of the need to offset negative impacts on water resources was strengthened by the recurring displays of extreme drought spells and rain events due to climate change and its impact on industrial and agricultural production activities.
- The realisation of the need to account for externalities does not easily translate in to actions without regulation and/or rewards. Actions can certainly be facilitated and guided through participation of private companies in payment schemes for EbA, as either buyers or sellers.
- With regulations such as current state-aid and procurement rules at the national and international level, payment schemes for EbA are rather pushed towards the private sector and non-profit sector/trusts that can function independently from public funding for certain projects and as a result have more flexibility than public institutions to engage in payment schemes for EbA.
- Currently, private initiatives are mainly targeted at offsetting the production of greenhouse gasses (e.g. CO₂ production). Carbon offsetting is easier, especially for global companies, as there are mechanisms in place and pricing is determined. Thus, there is still an enormous potential for payment schemes targeted at increased infiltration and retention of water in our landscapes.
- Private companies using water resources (e.g. water production companies, industries relying on a continued supply of water for production, tourism sector relying on public water features, etc.) and companies prioritising environmental concerns in their company policy are likely to engage as buyers in payment schemes for EbA targeted at increased infiltration and retention of rainwater. This can help ensure that production regions for the resources that the companies sell are adapted to the changing climate and thus ensuring the continued supply of the necessary water resources.
- Reputational and even financial risks (e.g. implications for credit ratings, the renewal of extraction permits, etc.) are factors that encourage (water production) companies to partake as buyers in payment schemes for infiltration and retention of rainwater.
- To facilitate the participation of potential private buyers (drinking water companies, private companies that depend heavily on water resources, etc.), clear certification/ecolabels should be developed specifically for payment schemes for EbA measures targeted at increased infiltration and retention of rainwater in our landscapes.

Private sellers:

- Private landowners and managers, especially farmers considering the large land surface they manage, should be motivated to engage as sellers in payment schemes for voluntary implementation of EbA measures targeted at increased infiltration and retention of rainwater (in addition to what is required through regulation). They can be motivated through equitable payment to infiltrate and retain water, on top of what is required by law. Especially in regions with a high water exploitation index and many competing demands.
- Given the climate urgency and biodiversity crisis, landowners and managers can expect more stringent regulations and enforcement in the future. This is exemplified by the Nitrogen crisis leading to more stringent regulations in the Netherlands and Flanders. Voluntarily engaging in private payment schemes for measures to improve water quantity and quality can provide an alternative revenue model for farmers, creating capacity to meet more stringent regulations.
- In Flanders, water companies acting as 'sellers' (implementing EbA measure on the land they manage/own) can subtract active surface water infiltration from their reported annual

groundwater abstractions (lowering certain charges for the water company, as abstractors of groundwater must pay a groundwater abstraction levy to the Flemish Government). Active infiltration of surface water (from streams & canals) is currently only used in a few occasions where a canal is passing a water abstraction site. This can be implemented more widely.

Private brokers:

- When working with private brokers, it is important to avoid turning to subsidy hunters that prioritise exploiting all loopholes in the system for profit, rather than improving the impact on climate change adaptation and the environment.
- There are many (private) organisations that possibly may want to claim the role of broker. The question is whether these organizations can be 'honest brokers'. An honest broker must be sufficiently independent to honour the entire spectrum of possible benefits and pitfalls (for buyers, sellers and the desired impact) in a fair manner. Honest brokers communicate this clearly towards involved parties so that negotiation between buyers and sellers is facilitated. Organisations that are strongly bound to a certain sector can play a facilitating role towards their target groups (sellers or buyers) but are not always independent enough to gain trust among all involved parties (Pielke 2007).

Reflections on the role of the public sector & Policy recommendations

The role of Payment schemes for EbA vs. regulation:

- Payment schemes for EbA are an additional instrument to reach environmental and societal objectives. Regulatory principles should still set adequate baselines for minimal ecosystem service provisioning by land managers and implement 'the polluter pays' principles for water quality, as well as water resources.
- Ideally, public and private payment schemes for EbA should be implemented where the full potential of policy and regulation has been deployed, i.e. to surpass the legally required baseline of ES-provisioning.
- Awaiting optimisation of policy and regulations, payment schemes for EbA have a disproportionately important role to reach climate change adaptation objectives.

The public sector as regulator

- The public sector should give higher political and legal priority to nature based solutions over technical solutions.
- The public sector should amend policy and regulation in areas where there is an underused potential of policy and regulations to reach the adequate baseline of ES provisioning.
- The need for more EbA targeted at increased infiltration and retention of water in our landscapes through amended policy, regulation and incentives is largely recognised by the public sector, but it faces barriers as well. It may not be easy to implement policy and regulatory changes based on the priority of drought and flood risk reduction, without being significantly influenced by other conflicting political agendas.
- The public sector has a crucial responsibility to facilitate the implementation of payment schemes for EbA measures, by identifying legal hurdles and solving them, lowering the administrative and logistical burden at the local, regional and national level and creating more willingness within private companies to invest in EbA to offset externalities (through awareness raising and more stringent regulations).

- Legal certainty for both "buyer" and "seller" is very important. Regulators have to determine the regulatory rules of the game for payment schemes for EbA:
 - What baseline of ES service provisioning is mandatory and should thus be regulated. Consequently, from what threshold of ES provisioning can we speak of voluntary EbA measures, on top of what is regulated.
 - What kind of climate adaptation measures are (not) suitable to be implemented in certain areas, given that the aim is to increase infiltration and retention of rainwater in our landscapes.
 - What kind of climate adaptation measures are eligible for payment in (public) payment schemes.
 - What conditions should be met by certifications/ecolabels, specifically for private payment schemes for EbA measures targeted at increased infiltration and retention of rainwater in our landscapes.
 - How does control and enforcement in (public) payment schemes work. What if commitments (and thus the delivery of targeted ES) are not met.
 - How can regulatory amendments avoid conflict between payment schemes for climate adaptation measures and other legislation in force.
- An opportunity existed to make certain EbA measures eligible for financial support under the Common Agricultural Policy - CAP. Member states will be given more freedom within the new CAP so that they can better respond to problems and opportunities in their own agricultural sector. To this end, member states must draw up National Strategic Plans (NSP) in which they describe how they want to apply the European rules. The CAP has been around since 1962 and was introduced to increase food production and ensure food security. The CAP has undergone a number of major changes since then. Climate and environmental objectives now play an increasing role. The intention of the new CAP is to further encourage sustainability. Within the first pillar of the CAP, there will therefore be more funding opportunities for green agriculture. These are also called eco-regulations. This should encourage farmers to adopt agricultural practices that are beneficial for the climate, biodiversity and the environment.
- With regulations such as current state-aid and procurement rules at the national and international level, payment schemes for EbA are rather pushed towards the private sector and non-profit sector/trusts that can function independently from public funding for certain projects and as a result have more flexibility than public institutions to engage in payment schemes for EbA.
- State-aid and procurement rules are implemented to avoid over-subsidizing certain activities, disturbing the international market. Although necessary to avoid such problems, the strict rules limit climate adaptation through payment schemes for EbA.
- There should be more flexibility in the EU Agricultural Policy (and other public policies) to enable payments for EbA beyond (cost-based) profit forgone as the risk of disturbance of international markets through payments for EbA measures (beyond profit foregone) is extremely low.
- By increasing flexibility in payment beyond (cost-based) profit foregone when implementing EbA measures, Greening Measures included in pillar 2 of the Common Agricultural Policy (CAP) would become more attractive. This would help link a larger part of the public budgets within agricultural policy of Europe (approximately 50 billion Euro per year for the whole EU) to the implementation of EbA measures.

- The issue of tenant-landowner regulations is a specific regulatory problem that can inhibit payment schemes for EbA arrangements on agricultural land. The following questions should be clarified:
 - How can amendments of the tenant-landowner regulation contribute to climate adaptation objectives?
 - Are the contracts for payment schemes for EbA transferable and inheritable, concerning the implementation and maintenance of EbA measures? Are they linked to the title deed?
 - How can contracts for payment schemes for EbA be in line with (amended) tenant-landowner regulation?
 - How can tenant-landowner agreements leave enough flexibility for change of tenants (e.g. in case of inadequate land management), whilst still motivation long-term investments by land tenants?
 - To what extent must a land-owner give consent to implement measures on the land that have long-lasting effects, e.g. on its hydrological functioning? E.g. can tenants install drainage infrastructure and/or elevate their lands without consent of land-owners?
- Landowners could be allowed to enter a profitable payment scheme (paying more than profit foregone for the ecosystem services delivered) only when they already meet the legally required level ecosystem service delivery. This can be an effective approach for law enforcement.

Regulatory changes to facilitate EbA implementation

- If implementation of EbA measures is facilitated through adjusted regulations, payment schemes for EbA will be facilitated as well.
- For larger-scale climate adaptation measures such as rewinding river valleys to create space for water, it may be necessary to buy out or trade land-uses. Public spatial planners need to set up an efficient land-banking database to enable necessary land-use shifts, through trading or buyouts and enable making efficient use of so called shifting points to plan trading or buyouts (e.g. when a farmer that retires stops its activities).
- Spatial planners should safeguard gradual transition zones from natural to agricultural areas, stimulating and facilitating opportunities for nature-inclusive farming and climate adaptation measures in those transition zones.
- Regulations should stimulate crop selections that fit better with the natural (hydrological) circumstances. This would create more room and support for EbA measures in adjacent (natural) areas that match and sustain the natural (hydrological) circumstances. This is especially important in the transition zones from natural to agricultural areas.
- In our forested landscapes, the deep drainage channel systems (i.e. 'rabatten' in Dutch) are often considered part of the cultural heritage but strongly hinder the implementation of EbA measures targeted at water retention in (non-productive) forested landscapes. Amendments of forestry regulation and cultural heritage regulation are needed to meet the current need for climate adaptation through EbA measures targeted at water retention and infiltration.
- The geographic system of a (sub-)catchment that should be considered as the scale to plan EbA measures and ES delivery, may not align with the institutional boundaries. There is a need for regulatory coordination and alignment when climate adaptation plans for a (sub-)catchment fall under jurisdiction of different regulatory institutions.

- The scale of the problems caused by climate change, requires management at the catchment scale. An '**Integrated Catchment Management**' approach to climate adaptation and mitigation targets the multitude of ecosystem services provided through Ecosystem-based Solutions (including EbA measures), planned at the catchment scale. This requires breaking down the currently institutionalised siloed thinking, i.e. implementing measures that target a single benefit/(ecosystem) service often through limited engineered solutions. Currently, institutional complexity and siloed thinking makes it difficult to implement (payment for) EbA measures at the catchment scale, that infringe on multiple domains, such as water course management, agricultural management, environmental management, spatial planning, etc.
- Significant changes and policy pressure are needed to accelerate the transformative adoption of Ecosystem-based Solutions (including EbA measures) through Integrated Catchment Management, including:
 - Investment in spatial/temporal mapping and planning of ecosystem services and drivers
 - Improved integration of planning units to encompass water management
 - Improved integration of water groups (flood, drought, pollution & aquatic biodiversity)
 - Improved funding and procurement frameworks to allow delivery of Ecosystem-based Solutions alongside engineered passive solutions
 - Increase apprentice, training and learning opportunities for cross partner working in Integrated Catchment Management and Nature Based Solutions

The public sector as buyer:

- Payment schemes for EbA can include the public sector as buyers (e.g. through European, national and regional public funding programmes) if the payment for EbA implementation and the EbA measure itself does not result in private economic benefit or a disturbance of international markets. Payment would then usually be limited to compensation of profit foregone, including the cost of implementation and the reduced economic activities.
- Given the climate urgency and biodiversity crisis, landowners and managers can expect more stringent regulations and enforcement in the future. Gradually phased out public payment schemes for EbA can facilitate meeting strengthened regulatory requirements and accelerate a societal transition to more stable water resources for society and the environment. Given that ideally 'the polluter pays principle' is applicable when it comes to meeting regulatory requirements, this should be a temporary measure justified by the importance of meeting urgent environmental and societal targets when it comes to water resources.
- Awaiting the right spatial planning circumstances for EbA measures that require significant land cover, we should already stimulate EbA measures that do not require a lot of land cover and are considered good environmental practice on a large scale through (gradually phased out) public payment schemes for EbA. For example the instalment of level-controlled drainage systems and their proper usage over the seasons.
- Besides payment, regulators can stimulate EbA implementation by giving potential sellers that invest in locally adequate EbA measures targeted at water infiltration and retention certain land and water use benefits.

- Abstractors of groundwater must pay a groundwater abstraction levy. The revenue of this taxation is often added to a larger general fund (e.g. the Flemish environmental budget or Mina-fund). Given the needs to protect the groundwater catchment areas and the need to make these sources climate-proof, the drinking water producers support the demand to dedicate (significant parts of) the revenues of this taxation to specific EbA measures assuring these source protection purposes.
- The model of the regional water boards ('waterschap') in the Netherlands is a good example of how independent governance structures (that are legal entities and have democratic representation) can centralise funding. They have their own taxation system, where buyers are companies (incl. farmers) and residents. The water board can then do targeted investments to maintain a balanced water system. This includes water management actions that relate to climate change adaptation (e.g. management for flood safety, but also the placement of controllable weirs on ditches to actively retain water during winter). Non-competitive buyers such as environmental NGO's should be supported in their land acquiring efforts for the sake of climate adaptation, as free market mechanisms are driving land prices sky high.
- We must link EbA implementation to the large public budgets within EU Common Agricultural Policy (CAP; approximately 50 billion Euro per year for the whole EU).
- The largest part of the budget in the CAP is going to direct subsidies that are straightforward and area-based (i.e. First Pillar of the CAP). Thirty per cent of Pillar 1 funding should be allocated to greening efforts, including EbA measures. Farmers should be motivated to invest this budget into effective EbA measures targeted at infiltration and retention of rainwater.
- The Second Pillar includes ensuring sustainable management of natural resources and climate action as one of its objectives. This pillar is known to be rather complex despite being effort-based.
- The CAP does not (yet) allow other forms of payment schemes, such as a (modelled) result-based payment schemes. However, with the reform of the CAP (and the growing momentum to reward value creation) this may become possible in the future.

The public sector as broker:

- The public sector should advise on the kind of climate adaptation measures that are (not) suitable to be implemented in certain areas, given that the aim is to increase infiltration and retention of rainwater in our landscapes.
- The public sector should coordinate monitoring of and communication on pilot (PES) projects that led to successful EbA implementation, ES delivery and fair compensation or payment. This can stimulate other potential sellers and buyers to take similar initiatives and in turn contribute to the strategic objectives of the public sector.
- Public sector should communicate on instruments that facilitate Payment schemes for EbA specifically targeted at increased infiltration and retention of water in our landscapes (e.g. ES quantification instruments). Farmers organisations, forests and nature managers, drinking-water companies and municipalities should be included in the discussion.
- Coordination of instrument selection to facilitate payment schemes for EbA is especially important in cross-border catchments. Water management authorities and regional authorities on both sides of the regional/national border should take the lead in guiding the selection of instruments (e.g. for ES quantification).
- Communication on climate adaptation should also manage expectations of the public. Even after large-scale application of EbA-measures, water bombs could still lead to flood events and extreme periods of droughts could still lead to water shortages. However the EbA measures can help

temper the impact of the now regular extreme rainfall and drought events. People should be aware of that complexity and accept it to allow durable carrying capacity for EbA measures.

Reflections on the role of the non-profit sector/trusts

- The third sector, non-profit sector/trusts, can fill the gap as brokers of integrated catchment-based planning and implementation of (Payment for) EbA measures. This role should include efforts in breaking down siloed thinking by enforcing collaboration across the first, second and third sector and pushing forward EbA approaches (complementary to the technical end-of-pipe solutions, often still pushed forward by the private sector).
- An "integrated broker" must be sufficiently independent to honour the entire spectrum of possible (climate) benefits in a fair manner. Organisations should be independent enough to gain trust among all involved parties.
- The offsetting of externalities by the private sector (e.g. for water consumption) should be guided by the non-profit sector in a broker/advisor role, to ensure the wider benefits from potential ecosystem services are generated and activities not limited to the ecosystem services needed for offsetting.
- In the EU especially, the third sector (non-profit sector/trusts) should establish more as a separate sector, i.e. independent from public (governmental) funding. Private funding would make it easier to set up attractive enough and integrated catchment-based projects, applying Payment for EbA.

Reflections on the role of the private insurance & banking sector

- The financial sector is still very much focused on financial aspects and not sustainability. The notion of value is not extended to social and environmental value yet. But awareness of social and environmental value is growing. The financial sector is assessing what the banking sector can and should do to address such issues. Here we are focussing Payment schemes for EbA, but meeting the minimal level of ES-supply could also result in getting reductions on insurance fees or interest rates.
- There is a lot of pressure on financial institutions to take aspects other than profit into consideration, such as climate change mitigation & adaptation, biodiversity, etc. One way of doing this is by offering lower interest-rates to spatial development projects integrating EbA measures/sustainable practices (e.g. leasing ground for regenerative farming) in the project.
- Potential non-competitive buyers such as NGO's should be supported in their land acquiring efforts for the sake of climate adaptation, as free market mechanisms are driving land prices sky high. One way of doing this is by offering lower interest-rates to NGO buyers with the aim of implementing EbA measures/sustainable practices (e.g. leasing ground for regenerative farming) on the land.
- The insurance sector would benefit from investments in EbA measures, as it owns a lot of land and pays for damage claims resulting from droughts and flooding. One way of doing this is through reductions on insurance fees for clients integrating EbA measures on their insured property.

2. ESTABLISH PAYMENT SCHEME

Understanding where, why and how measures can be designed to deliver the targeted ES's (through knowledge gathered on the catchment characteristics, its water resource risks and challenges, and the potential for EbA measures to alleviate these challenges) helps create a mandate for action.

The next stage of the engagement process, is where this mandate for action is communicated to the identified stakeholders to **establish a (type of) payment scheme**.

2.1 Setting boundaries to rewarding schemes for EbA

Depending on the scale of the payment scheme, potentially interested buyer and seller characteristics may change, and different communication tactics (audience-message-channel) may be recommended. Successful engagement is important to gather support for the final business model and payment scheme principles.

Reflections on the scale of action

- It is important to have payment schemes at different scales, as they serve complementary purposes.
- To **maximize the impact of EbA measures on targeted Ecosystem Services** through a landscape-based approach (i.e. specific shifts in land management, tailored to the (micro-)catchment's hydro-geological and social-economic characteristics), a **local or regional approach (NUTS 2-3)** is recommended.
- To **generate broad shifts in land management** for generic problems that can be solved through a uniform approach to EbA, **national or even international payment schemes (NUTS 1)** with simple and easily accessible scheme principles are recommended to increase seller participation.
- Both small scale and large scale payment schemes need brokerage at a certain stage in the payment scheme development to prioritise and invest in the right EbA-measures. Sudden increases in available budgets for large scale (public) payment schemes is not always followed fast enough by human resources capacity building to help guide those investments towards the most effective EbA measures. A long-term spending horizon or a gradual increase in annual budgets (i.e. the opportunity to let the fund grow in capital) allows for a gradual brokerage capacity building. Some measures require a planning horizon of multiple years. Especially the long-term horizon is needed to also maintain the measures and investments.

2.2 Effort vs. (modelled) result-based payment schemes

Reflections on the effort-based and (modelled) result-based approaches

Effort-based payment schemes for EbA with fixed payments for implemented EbA measures, regardless of the modelled or measured impact of the measure in that location, are currently the most common. This approach can be applied on large scale and does not require a lot of administration, lowering transaction costs. In most cases, at-random-checks are done to assess the quality and effectiveness of implemented measures.

- Effort-based Payment schemes with fixed payments (based on expert assessments) for the implemented number or surface area of EbA measures, can be applied on larger scale and do not require a lot of administration (e.g. public subsidy schemes to implement buffer strips, hedges etc.). These simply relate to a certain amount or area of measures being implemented for a fixed price per amount/area.

- Effort-based payment schemes for EbA (e.g. greening measures integrated in the EU Common Agricultural Policy) often do not deliver their intended effect due to poor implementation of measures or implementation of measures in unsuitable locations (cf. chapter 1.1). Such examples result in growing support for result-based rather than effort-based payment schemes for EbA. Especially there where the scale at which is operated allows some added complexity.
- Poor or lacking implementation in effort-based payment schemes for EbA is often not fined due to limited at-random-checks. To increase their effectiveness, more regular checks and enforcement are needed, but this would increase the (transaction) costs of the schemes.

In **result-based payment schemes** for EbA there are conditional payments based on the quantified ES resulting from implemented EbA measures, measured directly or estimated through proxy indicators (ex-post). Resulting ES of EbA measures are dependent of the quality of and location where the measures are implemented.

- For buyers, result-based payment schemes for EbA are more attractive. Buyers want to ensure that their investments result in the targeted ES delivery. There needs to be value creation with clear and repeatable metrics, e.g. KPI's (Key Performance Indicators).
- Result-based payment schemes for EbA can motivate sellers to implement qualitative measures in the best location for ES delivery, to increase payments received.
- The outcome of many EbA measures is uncertain as benefits may only be measurable under certain conditions and after certain time frames, making it difficult to implement strictly result-based payment schemes.
- **Modelled result-based** payment schemes for EbA can provide a solution for ES that are difficult to measure in a short time-frame, such as infiltration and retention of rainwater in our landscapes. In modelled result-based payment schemes for EbA, levels of ES provisioning resulting from implemented measures are estimated (**qualitatively or quantitatively**) based on models and linked to certain levels of payment for the seller. The same EbA measure applied in upstream or downstream location could then result in higher or lower payments, reflecting the modelled impact of EbA measure on targeted ES.
- Similar to result-based payment schemes, modelled result-based payment schemes can also motivate sellers to implement qualitative measures in the best location for ES delivery, to increase payments received. Moreover, depending on the complexity of the models this can be applied in larger scale payment schemes.
- In modelled result-based payment schemes for EbA, levels of ES provisioning resulting from implemented measures can be estimated **qualitatively** based on (spatial) indicators. By considering the parameters that have been proven to affect the effectiveness of measures, one can skip the actual modelling and use the identified (spatial) indicators instead. The [PROWATER Output 3 'The water system map for Europe'](#) is such a spatial indicator that can be used for payment schemes targeting groundwater recharge by infiltration and retention of rainwater. Based on the [interpretation of spatial indicators on the map](#), higher levels of payment can be linked to EbA measures implemented in the zone that is considered most suitable to deliver the targeted ES, depending on the type of catchment. All this, without significant increases in transaction costs.
- In modelled result-based payment schemes for EbA, levels of ES provisioning resulting from implemented measures can be estimated **quantitatively (based on quantified ES delivery)**. This requires more expertise from brokers (and sellers), given that precise land use and land cover changes will have to be analysed using complex quantitative models, ideally based on detailed data layers of the local area. This will be linked to higher transaction costs. However, if ES from

different EbA measures can be quantified by models, a compelling business case can be developed for investment in EbA.

- [PROWATER Output 4, an instrument to quantify impact on infiltration and retention of rainwater after implementation of EbA measures](#), can contribute to modelled result-based payment schemes for EbA using **quantitative** estimates of ES delivery and targeting infiltration and retention of rainwater as ES. Besides differentiated payment for EbA measures based on modelled impact on ES, the tool can be used by brokers with the necessary expertise to assess how much closer we get to the targeted amount of additional infiltration and retention of rainwater at the catchment level, after implementation of planned EbA measures. A modelled quantification for various weather scenarios can show the performance and trade-offs that may occur. The interplay of processes may result in shifts between recharge, runoff and evapotranspiration. Results are determined by combinations of weather patterns, soil properties, topography and vegetation.

Alternatively, *ex-ante* primary research can be undertaken to demonstrate the link between management (implemented measures) and resulting targeted ES ('cause-and-effect') before running simple effort-based payment schemes. Ultimately, much will depend on the degree of uncertainty which buyers will tolerate. If the level of uncertainty is reasonably small, it may be possible to limit a more conclusive demonstration of cause-and-effect to the monitoring stage (Smith et al. 2013).

- At the same time, we should also be careful that requests for more data on the link between management (implemented measures) and resulting targeted ES ('cause-and-effect'), as a condition for action and participation in payment schemes for EbA, are not (unconsciously) used as a defensive mechanism to avoid changing more comfortable business as usual routines and practices (Randall and Brown 2015).

3 NEGOTIATE AND IMPLEMENT

3.1 Negotiate agreements: price setting

Reflections on the different approaches to price-setting

With **effort-based payment schemes** for EbA, the payment is due for the implemented number or surface area of EbA measures. This is compatible with simple ‘fixed price’ payment schemes, with prices set by the buyers (advised by brokers).

- Fixed price schemes can be perceived as unfair due to the local differences in implementation cost, effectiveness and income loss. Consequently, the success of the agri-environmental schemes can be very region-dependent.
- Payment schemes at the international level need to consider the differences in competitiveness and costs across the regions and nations by equivalent differences in pricing for the delivered ecosystem services across the regions and nations. However, the determination of compensation for regional differences may be highly complex.

With (modelled) **result-based payment schemes** for EbA, the payment is due for the measured or modelled impact on targeted ecosystem services. The payment per unit of delivered ES is fixed and determined by the buyer (advised by brokers), but total payment will vary depending on the output delivered by the seller.

Alternatively, the price can also be set by the sellers, through **auctions**. Auctions (also ‘reverse auction’ or ‘procurement auction’) are a contractual design feature that invites potential ES sellers to submit price offers at which they are willing to sign a payment for EbA contract. Buyers can negotiate these quotations (e.g. through the online trading platform NatureBid⁶).

- Auction motivate sellers to submit competitive bids, as only these have a chance of being granted the contract.
- Given a fixed budget, auctions allow for the maximization of ES delivered. The costs of implementing EbA measures can be substantially lower when prices are influenced by market mechanisms active during reverse auctions, where multiple competing landowners offer to deliver services for a certain price and only competitive bids will be granted the contracts.
- Auctions help to reveal private willingness-to-accept (WTA) and private opportunity costs (Ferraro 2008). Although it can take a while before landowners are able to benchmark what is a fair price.
- Auctions can work well when a EbA measures are needed in a specific area to efficiently solve a catchment-specific issue. This can bring buyers and sellers together at a relatively low transaction cost and lead to better value for money (i.e. allowing to implement more with the same budget).
- Auctions can be perceived as unfair as the chance of success may depend on the negotiation skills of the landowner.
- If pricing from neighbouring land-owners becomes public, this may be detrimental to social relations and trust in the broker.

⁶ [NatureBid](https://www.naturebid.org.uk/) is an online trading and environmental matchmaking platform, led by [Sylva](#), in collaboration with the Environment Agency. It brings together buyers with sellers. A core offering of NatureBid are reverse auctions which ensure value for money in delivery of environmental outcomes, but the platform can also support alternative approaches, such as a prize fund, or simply using NatureBid as an engagement tool. <https://www.naturebid.org.uk/>

In a **Vickery auction**, winners do not receive their winning bid, but rather the amount offered by competitors they have under-priced. As a result, winners receive a payment that is slightly above their bid.

- Vickery auctions are assumed to discourage excessively high bids, as these only increase payments to competitors (Schomers and Matzdorf 2013).

Where EbA are very complex **one-to-one advice and price setting** often has to be used to tailor the payment scheme to the individual landowner (potential seller). An advisor (ideally, an honest broker) visits the landowner, designs the EbA with the farmer to ensure it works alongside their business model and the advisor agrees an individual grant based on quotes for the work. The grant rate is usually static but flexibility can be used with the system and all grants go through a panel to ensure independence and robustness.

- There are opportunities in blending auction and one-to-one price setting where advisors set the ecosystem value of the EbA which is then run through an auction system to ascribe a cost / ecosystem value ratio.

Larger scale **government funds**, where the budget is allocated to projects that apply for funding, can be seen as a type of auction through. However, the project partners that apply for and are allocated a certain budget (supported by a cost-benefit analysis) then need to engage and collaborate with sellers to implement EbA measures. Buyers and sellers then needs to follow the necessary procurement rules, state-aid and other stringent regulations when public funding is involved.

Reflections on risk of non-delivery of targeted ecosystem services

Some aspects that do affect the outcome of EbA-measures (such as weather) cannot be known beforehand and/or controlled, but can significantly impact the delivery of ES. This may keep potential buyer from investing in payment schemes for EbA.

There is potential in a hybrid approach between effort-based and (modelled) result-based payment schemes for EbA, with fixed compensation of profit-forgone resulting from implementation of measures (preferably upfront, to attract potential sellers), but with additional (bonus) payments based on quantitative estimates or measured ES delivery resulting from implemented measures. This is concept is known as a **prize fund or bonus payment**.

In case of **prize funds** or **bonus payments**, certain outcomes in the scheme are compensated by fixed or variable bonus payments, set by the buyer.

- An agglomeration bonus or fixed payment for farm sign ups in the same area can motivate participants to convince additional sellers to join the payment scheme for EbA (Parkhurst et al. 2002).
- A more complex variable **result-based bonus payment** can motivate sellers to implement qualitative measures in the best location for ES delivery, as variable bonus payments are made depending on the quantitative estimates or measured ES delivery resulting from implemented measures.

Alternatively, if the risk of interventions being undermined is high, insurance can be included as part of the scheme. Under the Woodland Carbon Code, for example, the project land owner(s) must demonstrate their commitment to permanence by replanting or undertaking compensatory planting should woodland area be lost due to wind, fire, pests, diseases or development (Smith et al. 2013).

Reflections on the durability of payment schemes and ES provisioning

- Payment schemes at the local and regional level should also give attention to building stable partnerships and involve communities in resolving the catchment-specific problems. This is especially important to help sustain the implemented EbA measures in the long term, potentially diminishing the expectation for long term payment by appealing to a sense of involvement and ownership, leading to voluntary upkeep of certain EbA measures by local communities.
- Failure to engage the local community and businesses is often cited as a reason for failure of payment schemes for EbA. It is imperative that this is considered within any future proposals.
- Sellers (e.g. farming communities) should be involved in the scheme design, including the operational responsibility for EbA measures, to stimulate the sense of ownership for the climate adaptation measures and improve long term support for the measures.
- Long-term payment to keep EbA measures in place could be linked to strictly result-based bonus payments, where certain levels of ES provisioning are measured in the field (directly or by proxy) and linked to certain levels of payment. This could ensure maintenance and monitoring by sellers.

Reflections on the concept of price setting

- Ideally, the rewarding mechanism for voluntary changes in land management (on top of what is required through regulation) should not be solely determined by profit forgone, but should also take into account the saved costs (shadow prices) and the wider societal benefits (i.e. co-benefits resulting from the EbA).
- Payment schemes can lead to ethical discussions on whether one should reward to restore what was destroyed in the first place or reward to maintain the good stewardship. By paying for land managers to act as stewards/custodians (i.e. rewarding and supporting existing good stewards of the land) rather than polluters, and by sharing the burden of payment across the supply chain, schemes would distribute rights and responsibilities in a manner more conducive to sustainability. Long-term success would stem from the activation and reinforcement of stewardship values, and from building trusting relationships between ES providers and programme officials via an inclusive program that feels fair.
- To increase fairness, a baseline can be established to determine if levels of existing land stewardship are markedly different and whether this has any implications for the distribution of payments to sellers. If there is a marked discrepancy, the bar may need to be set higher in terms of the interventions that qualify for payment for land managers with bad scores of land stewardship.

3.2 Minimise friction/lower transaction costs

While negotiating agreements on prices, required administration, contracts etc. it is important to minimise friction/transaction costs. Perceptions of complexity linked to administrative costs (as part of the transaction cost) and the implications of this upon the requirements of sellers is often cited as a reason for failure of payment schemes for EbA.

Payment schemes for EbA may come at a higher transaction cost, due to excessive paperwork, administration, permits, forms, etc. required by the scheme. Reducing the transaction costs will increase acceptability with potential sellers.

Reflections on transaction costs and how to lower them

- Transaction costs can be lowered by **advisors/honest brokers** (usually from the public or non-profit sectors) that identify and streamline public and private payment schemes that can be accessed and combined and can point out opportunities for both farmer and environment. This is

especially important in local and regional payment schemes, to reach the targeted ES and effectively solve the catchment-specific problems.

- Advisors (brokers) take up an important additional role in (modelled) result-based payment schemes, guiding the ES quantification. **Models** can greatly reduce the cost of this role, while maintaining the quality of the assessment. The [water system map](#) and [ES quantification model](#) delivered by PROWATER are such tools that advisors can use to assess the impact of measures in more targeted payment schemes for EbA at the (micro-) catchment scale.
- **Trading platforms** are designed to reduce the transaction costs between the buyer and the seller by creating a, usually online, platform. Examples include EnTrade and Nature Bid but also offline auctions such as the ones listed above.
- Trading platforms are well documented in the literature and usually serve as a central place to compile and assess opportunities (Day and Couldrick 2013). However, they seldom replace the need to one-to-one support especially where more complex actions are required.
- When applying reverse auction through online platforms, it is important to remain inclusive and consider the limited access to online auction platforms for certain potential sellers. Advisers on the ground can compensate for this.
- Bundling and stacking rewarding schemes (identifying and streamlining public and private payment schemes that can be accessed and combined) can result in more attractive payments for ES and streamlined processes for buyers and sellers (*cf.* chapter 5).

Reflections on friction

- Low friction in the payment scheme development process requires early and consistent engagement to understand business model of the sellers.
- Advice on actions should be simple, relevant and costed.
- The developed payment schemes for EbA need to be communicated and promoted to minimise friction and increase acceptability through better understanding and familiarity with the proposed payment schemes.
- Talking to landowners and field visits are the most effective way to generate lasting connections, increase understanding and acceptability of payment schemes for EbA.

For open source common templates to tools, grants and contracts for small-scale PES projects, you can visit the [PES toolbox, designed by the Interreg Channel project CPES](#) (Channel Payments for Ecosystem Services)

The CPES toolbox has been designed to give those looking to establish a PES an understanding of the tools required. This is achieved by allowing the user to view tools used by the project partners and other tools, not used in the case-studies, that may be equally useful.

[FIND THE CPES TOOLBOX HERE⁷](#)



⁷ <https://www.cpes-interreg.eu/en/pes-toolbox/pse>

Examples of PES projects and associations, for your inspiration

- The Interreg Channel project CPES included a [PES pilot in Devon](#), led by Westcountry Rivers Trust. The PES pilot launched a reverse auction through the online platform [NatureBid](#). This offered farmers and landowners the opportunity to bid for grant funded support for interventions across the Lyd catchment. The resulting 23 contracts between the Private sector companies (through the [Tamar Water Stewardship Business Board](#)) and farmers, were targeted at water quality, water retention and infiltration, soil health, biodiversity, and Carbon sequestration.
- [Life Climark – Beyond Carbon](#), is Life project that developed a local **Climate Credit market** applicable to Catalonia in Spain, as an exchange unit for voluntary investments by private companies in Climate Change Mitigation and Adaptation Forestry Projects (CCMAFP). The targeted management impacts include increased Carbon sequestration, stabilized groundwater and river base flows, increased biodiversity and fire risk reduction. The Climate Credit market is expected to incentivise multifunctional forest management.
- [Forests for Water \(Trinkwasserwald\)](#) is a German private non-profit association, that restores conifer monocultures (owned by private or public bodies) to mixed forests. This EbA measure is targeted at enhancing groundwater production through increased infiltration. Buyers include private individuals or enterprises. Trinkwasserwald acts as a broker between buyers (private persons or enterprises) and sellers (forest owners).
- [PantaiES](#) is an Italian business consultancy (brokering) company that applies innovative capitals approach promoted by the '[Natural Capital Coalition](#)' to facilitate PES agreements. This combines biophysical and economic assessment of targeted Ecosystem Services (mainly cultural, biodiversity, forestry and agricultural ES) with the promotion of adequate site-specific management of natural capital. The pantaiES '[Bank of compensations](#)' serves as an online platform for reverse auction, where farmers propose their land and possible Ecosystem Services to be targeted.

4 MONITOR, REPORT & VERIFY

After implementation, we need cost-effectiveness reviews through monitoring and evaluation of payment schemes and their impacts on the targeted ecosystem services. This **adaptive management** can lead to new insights and adjustments of the payment schemes for EbA, where necessary. Evaluation should be a continuous process, as new buyers may emerge over time.

Reflections on the need for monitoring, reporting and verification in payment schemes for EbA

- Flexibility and adaptive management should be incorporated within payment schemes for EbA in order to accommodate external changes. Reasonably foreseeable external changes should be reflected in the baseline that will be used to gauge additionality (Smith et al. 2013).
- Approaches for the monitoring and reporting to be applied in the payment scheme, to help guard delivery of the targeted ecosystem services and acceptability of (transaction) costs, should be discussed well in advance of the implementation of measures.
- Schemes should incorporate measures to minimise the risk of creating perverse incentives, for example guidelines on the way in which ecosystem service outcomes should be achieved and maintained (Smith et al. 2013). Without this there may be a risk of creating perverse incentives. E.g. land or resource managers paid to sequester carbon might plant non-native tree species which sequester carbon at a faster rate than indigenous species, yet broad swathes of non-native vegetation might lead to detrimental impacts on biodiversity and contribute to wider problems such as acidification, disease transmission or fire risk (Smith et al. 2013).
- Payment scheme for EbA can have unintentional side-effects caused by the implemented EbA measures. The design of an effective payment scheme for EbA with no or socially acceptable negative side effects, requires a lot of considerations, including legal, financial, political, ethical and practical (including spatial planning) aspects. Schemes should incorporate safeguards to minimise the risk of trade-offs. E.g. new woodland certified under the Woodland Carbon Code must be managed in accordance with the UK Forestry Standard, including all the environmental and social aspects of this (Smith et al. 2013).
- Arrangements for monitoring should extend beyond the geographic boundaries of the payment scheme for EbA in order to assess the magnitude of any leakage (external negative impacts) and consider any potential measures to minimise leakage (Smith et al. 2013).
- Through adaptive management and flexibility, payment schemes can take into account changing societal realities, such as rising material costs, to determine the cost of implementation to be compensated. Long-term result-based bonus payments can also be reviewed, in case new insights and/or societal realities impact on the value assigned to ES units.

5 CONSIDER OPPORTUNITIES FOR PAYMENT OF MULTIPLE ES

Throughout the development and implementation process, we recommend looking for opportunities to integrate multiple Ecosystem Services into the payment scheme.

Reflections on opportunities for Integrated catchments-based approaches.

- Payment schemes can address wider catchment issues and design solutions for ecosystem service provision at a catchment scale rather than focusing on a single pressure. This is known as Integrated Catchment Management (ICM). Payment schemes can include water quality services, biodiversity, carbon sequestration, etc.
- Experience within the partnership through Interreg projects such as Triple C⁸ (Interreg Atlantic Area) and CPES⁹ (Interreg France England/Channel) shows that ICM approach has the potential to attract more sellers and buyers into one scheme. At the same time transaction costs can be lowered, compared to an approach where sellers and buyers need to step into multiple schemes and thus multiple contracts with their own conditions and administration.
- Opportunities for private payment schemes are linked particularly with the loss/change of agricultural subsidies and the potential for schemes to provide multiple benefits linked with agricultural reform or resilience associated with diversification opportunities.
- Delivery of “clean and plentiful water” as a target within the UK government’s 25-year Environment Plan (2018) is explained in public facing reports, but frameworks are still being developed. There are opportunities here to build in water resource payment schemes targeting rainwater infiltration and retention as a primary driver.
- Recreation and health effects of green spaces are regularly cited as something for which a form of “payment” can be collected, as green infrastructure needs management and maintenance and provides multiple ecosystem services (including health effects). This maintenance often takes place in combination with social employment (another societal service provided). The proximity of green space can also have indirect effects on property value. This added value could be returned in a form of payment.
- When the payment scheme is broadened to many ES, this can result in the involvement of more organisations and stakeholders. This can add complexity to the PES scheme, making it less flexible and dynamic. This should be avoided through for example bundling or layering/stacking payment schemes for Ecosystem-based Solutions (including EbA) with adequate levels of monitoring, reporting and verification (MRV) of the delivered ES.

Reflections on bundled rewarding schemes with a single buyer

- With **bundled payment schemes**, a single buyer (or 1 consortium of buyers) is involved in the payment for multiple ‘bundled’ ecosystem services. The seller (or the consortium of sellers) can score on multiple KPI’s (Key Performance Indicators) linked to different eligible ecosystem services, that arise from the same geographical area. This is integrated into one easily accessible system that is clear to the sellers and takes into account state-aid regulations (capping the maximum payment). The higher the score, the higher the payment (Smith et al. 2013).

⁸ <https://www.triplecproject.eu/>

⁹ <https://www.cpes-interreg.eu/>

- This is applicable for smaller scale payment schemes for EbA, involving 1 buyer (or 1 consortium of buyers) and a limited number of sellers.
- By bundling all ES co-benefits, the potential payment becomes higher and this provides more leverage to attract potential sellers.

Reflections on stacked/layered rewarding schemes with multiple buyers

- With **stacked/layered payment schemes**, multiple buyers are involved in the payment of multiple 'stacked' ecosystem services. The seller (or the consortium of sellers) can score on multiple KPI's (Key Performance Indicators) linked to different eligible ecosystem services, that arise from the same land. This is integrated into one easily accessible system that is clear to the sellers and takes into account state-aid regulations (capping the maximum payment). The services are unbundled, and can be sold separately to different buyers (Smith et al. 2013).
- This is applicable for smaller scale payment schemes for EbA, involving a limited number of buyers and sellers.
- By stacking all ES co-benefits, the potential payment becomes higher and this provides more leverage to engage potential sellers.
- The involvement of multiple buyers may be especially important when the spatial interdependence of the targeted ecosystem services is high (i.e. where the targeted ecosystem services derived from one location are heavily dependent on the delivery of ecosystem services in another location; Smith Day and Binner 2019)

CONCLUSION

Through expert consultation and experiences within the partnership we have identified a number of key recommendations when implementing a payment scheme for Ecosystem-based Adaptation (EbA) measures, specifically targeted at increased infiltration and retention of water in our landscapes. Many of the practice recommendations are targeted at local/regional initiatives that wish to set-up a smaller scale payment schemes. We believe the practice recommendations included can facilitate new private and public payment schemes. Not all issues can be easily solved or avoided. But being aware of the potential pitfalls and opportunities described is already a key-advantage.

We invite readers to look into applications of the spatial prioritisation tool (the water system map) and ES quantification tool applied to the 2 Seas region for PROWATER. These modelling tools can provide a solution for payment schemes that want to strengthen their business case, targeting ES that are difficult to measure in a short time-frame, such as infiltration and retention of rainwater in our landscapes. Through more robust business cases, we expect to attract more buyers and sellers to partake in water quantity payment schemes in the future.

We see potential in modelled result-based (bonus) payments for EbA, where EbA outcomes of ES provisioning are estimated (qualitatively or quantitatively) based on models and linked to variable (bonus) payments for the seller. This can help target funding in private and public payment scheme for EbA towards locations and measures with the largest expected impact on infiltration and retention of rainwater. Alternatively, we consider reverse auction as a promising approach to set a fair price on targeted ES in relatively new water quantity payment schemes (as the price is determined by the seller, i.e. landowner/land manager) while at the same time taking into account regional social-economic differences.

We push forward the potential benefit for the insurance and banking sector to invest in EbA measures, as the insurance sector pays for damage claims resulting from droughts and flooding. One way of doing this is through reductions on insurance fees and reduction in interest rates for clients integrating EbA measures on their ensured and acquired property.

There are also important messages for policy makers at the local, regional and (inter)national level. Current policy and legislation can complicate the establishment of impactful private as well as public payment schemes for EbA. Most importantly on the short term, clear certification and (government monitored) ecolabels should be developed specifically for payment schemes for EbA measures targeted at increased infiltration and retention of rainwater in our landscapes, to attract potential private buyers to invest in water quantity payment schemes.

Because EbA-measures often have very broad societal benefits, the most evident buyers are tax-payers, and the public sector represents those buyers. Yet it seems that payments by the public sector towards private land-owners is the most complex. One of the most important policy-recommendations is that there should be more flexibility in the EU CAP as well as other public funding to enable (bonus) payments for EbA beyond (cost-based) profit forgone, as the risk of disturbance of international markets through payments for EbA is extremely low. Most EbA-measures do not result in any private economic benefit for land-owners. These private benefits of EbA would only emerge after many years/decades when a critical level of implementation is reached at catchment/landscape scale. By increasing flexibility in payment for EbA beyond (cost-based) profit foregone for EbA measure targeted at infiltration and retention of rainwater in our landscapes, Greening Measures included in the CAP would become more attractive. This can help link a larger part of the public budgets within CAP (approximately 50 billion Euro per year for the whole EU) to the implementation of EbA measures targeted at infiltration and retention of rainwater.

REFERENCES

- Collentine, D., & Futter, M. N. (2018). Realising the potential of natural water retention measures in catchment flood management: Trade-offs and matching interests. *Journal of Flood Risk Management*, *11*(1), 76–84.
- Day, B., & Couldrick, L. (2013). Payment for ecosystem services pilot project: the Fowey river improvement auction. *Defra, London*.
- Ferraro, P. J. (2008). Asymmetric information and contract design for payments for environmental services. *Ecological Economics*, *65*(4), 810–821.
- Fripp, E. (2014). Payments for Ecosystem Services (PES): A practical guide to assessing the feasibility of PES projects. CIFOR.
- Ghazoul, J., Garcia, C., & Kushalappa, C. G. (2009). Landscape labelling: a concept for next-generation payment for ecosystem service schemes. *Forest Ecology and Management*, *258*(9), 1889–1895.
- Holden, P. B., Rebelo, A. J., Wolski, P., Odoulami, R. C., Lawal, K. A., Kimutai, J., Nkemelang, T., & New, M. G. (2022). Nature-based solutions in mountain catchments reduce impact of anthropogenic climate change on drought streamflow. *Communications Earth & Environment*, *3*(1), 51.
- Karrasch, L., Maier, M., Kleyer, M., & Klenke, T. (2017). Collaborative landscape planning: Co-design of ecosystem-based land management scenarios. *Sustainability*, *9*(9), 1668.
- Lü, Y., Li, T., Whitham, C., Feng, X., Fu, B., Zeng, Y., Wu, B., & Hu, J. (2020). Scale and landscape features matter for understanding the performance of large payments for ecosystem services. *Landscape and Urban Planning*, *197*, 103764.
- Parkhurst, G. M., Shogren, J. F., Bastian, C., Kivi, P., Donner, J., & Smith, R. B. W. (2002). Agglomeration bonus: an incentive mechanism to reunite fragmented habitat for biodiversity conservation. *Ecological Economics*, *41*(2), 305–328.
- Pielke Jr, R. A. (2007). *The honest broker: making sense of science in policy and politics*. Cambridge University Press.
- Randall, R., & Brown, A. (2015). In time for tomorrow. *The Carbon Conversations Handbook*.
- Scarano, F. R. (2017). Ecosystem-based adaptation to climate change: concept, scalability and a role for conservation science. *Perspectives in Ecology and Conservation*, *15*(2), 65–73.
- Schomers, S., & Matzdorf, B. (2013). Payments for ecosystem services: A review and comparison of developing and industrialized countries. *Ecosystem Services*, *6*, 16–30.
- Seddon, N., Chausson, A., Berry, P., Girardin, C. A. J., Smith, A., & Turner, B. (2020). Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Philosophical Transactions of the Royal Society B*, *375*(1794), 20190120.
- Smith, S., Rowcroft, P., Rogers, H., Quick, T., Eves, C., White, C., Everard, M., Couldrick, L., & Reed, M. (2013). *Payments for ecosystem services: a best practice guide*.
- Smith, G., Day, B., & Binner, A. (2019). Multiple-purchaser payments for ecosystem services: An exploration using spatial simulation modelling. *Environmental and Resource Economics*, *74*, 421–447.

- Tacconi, L. (2012). Redefining payments for environmental services. *Ecological Economics*, 73, 29–36.
- Uthes, S., Matzdorf, B., Müller, K., & Kaechele, H. (2010). Spatial targeting of agri-environmental measures: cost-effectiveness and distributional consequences. *Environmental Management*, 46, 494–509.
- van de Sand, I. (2012). Payments for ecosystem services in the context of adaptation to climate change. *Ecology and Society*, 17(1).
- Vignola, R., Harvey, C. A., Bautista-Solis, P., Avelino, J., Rapidel, B., Donatti, C., & Martinez, R. (2015). Ecosystem-based adaptation for smallholder farmers: Definitions, opportunities and constraints. *Agriculture, Ecosystems & Environment*, 211, 126–132.
- von Thaden, J., Manson, R. H., Congalton, R. G., López-Barrera, F., & Jones, K. W. (2021). Evaluating the environmental effectiveness of payments for hydrological services in Veracruz, México: A landscape approach. *Land Use Policy*, 100, 105055.
- Wallbott, L., Siciliano, G., & Lederer, M. (2019). Beyond PES and REDD+: Costa Rica on the way to climate-smart landscape management? *Ecology & Society*, 24(1), 24.
- Ward, F. A. (2023). Integrating water science, economics, and policy for future climate adaptation. *Journal of Environmental Management*, 325, 116574.
- Waylen, K. A., & Martin-Ortega, J. (2018). Surveying views on Payments for Ecosystem Services: Implications for environmental management and research. *Ecosystem Services*, 29, 23–30.